



Roof Condition Report

9CFCS- Sewage Treatment

Intermountain Power Service Corporation
850 West Brush Wellman Road
Delta, Utah

June 2001

Brower & Associates
Architects & Planners

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INTRODUCTION

During the months of May and June, 2001, most of roofs of the Intermountain Power Project were evaluated by Brower & Associates, Architects and Roof Consultants, with regards to the condition of their roofs. Each roof was drawn, examined, photographed and analyzed.

The data taken from each roof was entered into MicroRoofer, a program produced and maintained by the University of Illinois at Urbana for the U.S. Army Corps of Engineers. The roof history of thousands of buildings, both military and civilian, are in the data base of the program. Each year, current data is added to the data base to keep the results of the evaluations up to date.

This report is the result of the inspection and the data gathered. Enough information is now available to make sound decisions about the repair and/or replacement of each roof.

PHOTOGRAPHS

The first section of the report is a photographic record of the current conditions of the roof. Since the roofs are very similar, no attempt was made to provide an exhaustive photo history of each building.

The enclosed photographs are provided to give the reader a look at the general layouts of the roof, showing equipment, sizes and visual descriptions of defects. The full data on defects can be found in a following section.

SECTION INVENTORY REPORT

To evaluate the roof in comparison with the other roofs in the data base, the design and construction had to be identified. Most of the information was available through visual observations, but some information had to be assumed.

The exterior walls of the buildings are generally made of concrete tees on the lower floors and metal siding above. The structural frame is steel columns, beams and joists. The roofs are typically installed on steel joists and metal decking.

All of the roofs were originally built-up asphalt over board insulation, topped with pea gravel. Some roofs have subsequently been recovered with an EPDM single membrane or polyurethane foam (PUF).

Without the original roof specifications or a destructive roof cut, the actual insulation material cannot be determined. Therefore, the insulation was assumed to be expanded polystyrene board three inches thick and hot-mopped into place, a very common practice. When further information is available, the correct data can be entered into the data base and new reports generated. However, the conclusions and costs produced by the report should be unchanged even if a different material is found.

The data gathered is from visual inspection of the roof surface. No attempt was made to inspect the condition of the insulation. Before major repairs are started, a roof cut should be made to see the current condition of the insulation in the areas in question.

ROOF INSPECTION WORKSHEET

Copies of the actual roof inspection drawings are included to show the size of each section of the roof and the location of equipment, access and defects. The drawing can be used to guide repairmen to the defects and compare the condition of the roof this year with subsequent years.

The defects typically include base flashings (BF), ponding (PD), roof drains (DR), surface deterioration (SP), metal caps (MC) and debris on the roof (DV). Each defect has a severity listed: low, medium or high. Defects are identified by comparing the actual on-site conditions with photographs of defects in the guidebook.

Thus, the information entered into the MicroRoofer program is consistent with all other information gathered for other projects. The results are, therefore, very subjective and do not vary from inspector to inspector.

VISUAL INSPECTION SUMMARY

The visual inspection gives unique information about each roof section. The area, perimeter and curb measurements are listed.

The summary also gives the Roof Condition Index (RCI). The RCI is calculated by combining the Flashing Condition Index (FCI), the Membrane Condition Index (MCI) and the Insulation Condition Index (ICI). During our inspection of the roofs, we found nearly all defects were with the base flashings and little, if any, visual defects in the membrane, such as blisters, splits, slipped asphalt plies or wind scour. The MCI, subsequently, is usually 100, meaning the membrane shows no defects. As mentioned earlier, the insulation was not evaluated and also shows an ICI of 100.

The RCI is a numeric score from one to one hundred, with anything under 60 requiring immediate evaluation and attention. The program estimates the cost of maintaining the roof each year for ten years and then makes an evaluation whether the roof should be maintained or replaced. An estimate is also made to the year when the roof should be replaced, based on the history of other similar roofs. The program only includes estimates for the coming ten years.

A list of the defects is included, with the severity and quantity. The FCI has the most typical defects. The membrane has few defects so the MCI is usually 100. Since the insulation was not examined, the ICI is always 100.

Maintenance, Repair & Replacement Analysis

With the roof drawings and the defect list, a workman can easily find the defect and correct it. The Owner also has a guide to the normal cost of the repairs.

The MR&R gives more information about the roof section, such as area and current age.

The program predicts a year for probable replacement without any repairs and another date if the suggested repairs are made.

The cost of repairs is estimated, along with the cost for replacement. The cost of repairs is compared to the cost of replacement and a recommendation is given: repair, marginal or replace. The user must consider that the recommendation is only for the particular section of the roof being reported. The overall condition of the entire roof should be evaluated before making a final decision.

The second page justifies the recommendation made. It also included design considerations that should be considered when the work is designed.

The last sheet lists the recommended corrective action for maintenance or repairs.

With the enclosed information, the Owner can sit down with the roof consultant to create a plan for roof repairs and replacements for the next ten years. An inspection schedule can be made and a structured plan formalized to assure that the roofs receive proper attention.

Summaries

The information from each individual roof is valuable to evaluate the work to be done on each section. Planners, however, need to see an overall picture of the project to make cost projections for future budgets.

The information for each section and visual reports are provided separately. MicroRoofer makes a summary of the entire project, which is furnished in this book.

The Section Inventory Report to the entire project is included. Individual reports are contained in the report for each building.

The Maintenance, Repairs and Replacement Summary (MR&R) lists the data for the entire project. The Roof Condition Index (RCI) for each section is listed in ascending order, to show which sections should be prioritized. The report also shows the change in the RCI if the suggested repairs are made, plus an estimate of the increased life of the roof. Then a recommendation is made, whether to repair or replace the roof and the estimated remaining life of the roof section.

Next is the Inspection Schedule Report, which lists the sections that should be examined each year. The sections with the most problems and lower RCI are listed for examination more frequently, while the entire project should be reviewed every five years.

The Distress Analysis contains all of the work listed in each individual report. The cost for each type of work is listed.

Finally, a proposed 10-year program is included, to help the Owner plan for the costs of the necessary work to keep the roofs intact and the building contents protected. This budget is a starting point for the discussion between the roof consultant and the Owner to determine the exact program to meet the Owner's budget and building needs.

Section Inventory Report

The Section Inventory Report is provided so the Owner can see the information on the entire project without going through each individual report. The same information is included in the reports for the individual buildings.

The report lists the construction characteristics of each building.

MR&R Analysis Summary

The Maintenance, Repair and Replacement Analysis Summary for the entire project is included to provide a convenient comparison between the sections. The sections are listed in ascending order of the RCI, with the lowest numbers listed first.

The report summarizes the cost of repairs, cost of replacements, the year of replacement and the change in the RCI if the repairs are made. It also gives a recommendation if the roof is marginal, should be repaired or replace.

Inspection Schedule Report

The Owner has a great deal of capital tied up in his buildings and their proper function. To keep the roofs in proper condition and to extend their life, the roof sections must be examined on a regular schedule by someone who is trained to identify potential problems.

MicroRoofer suggests a yearly inspection schedule, based on the Roof Condition Index (RCI) of each section. Just as a sick child requires more attention, an aging roof needs more care to allow it to give its maximum service.

A schedule of inspections is included to help the Owner make an operational plan to see each roof section when it is most advantageous. An automobile needs some maintenance every 3,000 miles and other work on 15,000 mile intervals. More expensive maintenance is scheduled at 30,000 and 60,000 miles. Similarly, the roof sections with the lowest scores should be visited more frequently. Every section should be inspected every five years and the reports redone.

The proposed inspection fees are based on a square foot cost of \$0.025 per square foot. The cost of this inspection was based on \$.04 per square foot.

The Owner can have an employee trained to make these inspections and maintain the data base. Or an outside consultant can be retained to make the yearly roof inspections and provide current reports.

Distress Analysis

This report provides the Owner a summary of the cost of each defect or distress. The report allows the Owner to determine the cost of repairing each class of defect, such as base flashing.

If the base flashing of all of the buildings were repaired, the repairs would easily outlive the roof membrane over the rest of the roof.

The most critical defects to repair are the roof drains. From the report, \$9,584 would be required to make all of the repairs.

Using this report, the Owner can direct his repair budget to the areas that most need the work.

10-YEAR PROGRAM

The Ten-Year Budget Report can be invaluable to budget planners as they try to allocate funds for roof maintenance, repairs and replacement. Most Owners spend money on their roofs only when an emergency presents itself, instead of making an intelligent yearly program of roof work.

Just as an automobile requires periodic maintenance to give maximum life and service, a roof needs yearly attention to prevent small defects from becoming roofing and budget disasters.

The 10-year program gives a budget outline for all of the work that is anticipated during the next ten years. If the work is not critical, it is spread over several years, as major repair projects. Replacements are also shown, along with the cost of insulation inspection and visual inspection.

For this project, a total of \$909,000 is estimated to maintain, repair and/or replace the roofs. The Owner should note, however, that the bulk of the roofs are listed for replacement within the next twelve years so the roof budget will grow substantially after ten years.

Date: JUN/13/2001		Section Inventory Report		Page 1	
Installation: IPP - Intermountain Power Project					
Building No.: 9CFCS		Section: 9CFCSA		Area: 160 Sq.Ft.	
Last Replacement: Occupancy: Controls		Original Construction:		1985	
Perimeter Parapet: 50 Ft. Exp. Joint: Ft. Adj. Wall: Ft. Roof Edge: Ft. Area Div.: Ft. Other: Ft. Access: EXTERNAL LADDER: Temporary Adj Roof Sec:					
Structural Frame:		STEEL: Bar Joists/Beams & Columns			
Roof Deck: STEEL					
Slope: 1/4					
Drainage: SCUPPERS					
Vapor Retarder:		UNKNOWN			
Insulation: EXPANDED POLYSTYRENE					
Thickness: 4 In.		Layers: 1		Tapered: N	
R-Value: 19					
Attachment: ADHESIVE - HOT					
Membrane: Mfg:		Spec. No.:			
Description:					
Protected Mem.: N					
Type: BUR: Asphalt					
Attachment: FULLY ADHERED					
Reinforcement: B.U.(HOT/COLD): Glass Felt					
Surfacing: AGG: Slag					
Walkways:					
Base Flashing: REINFORCED ASBESTOS					
Flashing Adhesive: HOT MOPPED					
Counterflashing: METAL					
Types: WALL/PARAPET					
Remarks:					

Installation: IPP - Intermountain Power Project

Selection Criteria

Building ID	9CFCS
Category Code	All
Membrane Type	All
Insulation Type	All
Deck Type	All
Roof Slope	All
Section Area	All

Sort Criteria

Building ID - Ascending

IPP

ROOF INSPECTION WORKSHEET				AGENCY/INST.:	
BUILDING <u>Sewage Treatment Control</u>		PER. FLASHING <u>51</u> LF	DATE _____		
SECTION _____		CURB FLASHING <u>0</u> LF	NAME _____		
BF-BASE FLASH	PP-PITCH PANS	SP-SPLITS	PA-PATCHING	DIS	OCC
MC-METAL CAP	DR-DRAIN & SC	HL-HOLES	DV-DEBRIS & VEG		
EM-EMBEDD MET	BL-BUSTERS	SR-SURF DET	EQ-EQ SUPPORT		
FP-FLASHED PEN	RG-RIDGES	SL-SLIPPAGE	PD-PONDING		

METAL ROOF
@ Guard House

160 #

SCALE: _____

↑
NORTH

VISUAL INSPECTION SUMMARIES

This building is a metal building, therefore, the Roofer program could not make a computer-generated report.

From visual inspection, the metal roof is in very good condition. The roofing panels were tight and not fasteners were loose.

The metal finish is in very good condition, with no sign of rusting or corrosion.

MAINTENANCE, REPAIRS & REPLACEMENT ANALYSIS

The building is a metal building, therefore, the Roofer program could not give a computer-generated analysis.

From visual inspection, the roof is in very good condition. The screws were all tight, as were the metal roof panels. Very little degradation of the roof materials was visible.

No maintenance work is required on this building at this time.



brower and associates



Roof Condition Report

9CFC- Paint & Solvent Storage

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June 2001

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Just as an automobile requires periodic maintenance to give maximum life and service, a roof needs yearly attention to prevent small defects from becoming roofing and budget disasters.

The 10-year program gives a budget outline for all of the work that is anticipated during the next ten years. If the work is not critical, it is spread over several years, as major repair projects. Replacements are also shown, along with the cost of insulation inspection and visual inspection.

For this project, a total of \$909,000 is estimated to maintain, repair and/or replace the roofs. The Owner should note, however, that the bulk of the roofs are listed for replacement within the next twelve years so the roof budget will grow substantially after ten years.

Photo No. 1



Date: JUN/13/2001		Section Inventory Report		Page 1	
Installation: IPP - Intermountain Power Project					
Building No.: 9CFC		Section: 9CFC-A		Area: 416 Sq.Ft.	
Last Replacement:		Original Construction:		1985	
Occupancy: Storage					
Perimeter Parapet: Ft. Exp. Joint: Ft. Adj. Wall: Ft. Roof Edge: 84 Ft. Area Div.: Ft. Other: Ft. Access: EXTERNAL LADDER: Temporary Adj Roof Sec:					
Structural Frame:		STEEL: Bar Joists/Bearing Wall			
Roof Deck: STEEL					
Slope: 2					
Drainage: GUTTERS & DOWNSPOUTS					
Vapor Retarder:		UNKNOWN			
Insulation: GLASS FIBER					
Thickness: In.		Layers:		Tapered: N	
R-Value: 19					
Attachment: MECHANICAL					
Membrane: Mfg:		Spec. No.:			
Description:					
Protected Mem.:		N			
Type:					
Attachment:					
Reinforcement:					
Surfacing:					
Walkways:					
Base Flashing:					
Flashing Adhesive:					
Counterflashing:					
Types:					
Remarks: Steel Roof					

IP12_003922

Installation: IPP - Intermountain Power Project

Selection Criteria

Building ID	9CFC
Category Code	All
Membrane Type	All
Insulation Type	All
Deck Type	All
Roof Slope	All
Section Area	All

Sort Criteria

Building ID - Ascending

42

62

IP12 003924

VISUAL INSPECTION SUMMARIES

This building is a metal building, therefore, the Roofer program could not make a computer-generated report.

From visual inspection, the metal roof is in very good condition. The roofing panels were tight and not fasteners were loose.

The metal finish is in very good condition, with no sign of rusting or corrosion.

MAINTENANCE, REPAIRS & REPLACEMENT ANALYSIS

The building is a metal building, therefore, the Roofer program could not give a computer-generated analysis.

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No maintenance work is required on this building at this time.